

## CLAIMS:

1. A method, comprising:  
  
calculating a ratio of transition count/pixel count using a pixel transition count and a pixel count for a printed image; and  
  
providing an estimate of toner consumption based on said ratio of transition count/pixel count.
2. The method according to Claim 1, further comprising:  
  
counting said pixel count and said pixel transition count per page using a field programmable gate array.
3. The method according to Claim 2, further comprising:  
  
using a pixel counter register in said field programmable gate array wherein said pixel counter keeps track "On" pixel on a page.
4. The method according to Claim 2, further comprising:  
  
using a transition counter register in said field programmable gate array wherein said transition counter register counts only "1 to 0" or "0 to 1" transition in horizontal scan direction using video data being sent to a print engine.
5. The method according to Claim 1, further comprising:  
  
providing said estimate toner usage by determining predetermined toner consumption per pixel value based on counting pixels and measuring toner usage for different types of images.
6. The method according to Claim 5, further comprising:  
  
storing said predetermined toner consumption per pixel values in a printer controller.

7. The method for providing said estimate toner usage by determining predetermined toner consumption per pixel value according to Claim 5, further comprising:

- (a) weighing a toner cartridge replaceable unit;
- (b) printing a predetermined amount of prints for a given size paper;
- (c) weighing the cartridge replaceable unit after finishing said predetermined amount of prints;
- (d) calculating toner mass consumption for said predetermined amount of prints and toner mass consumption for one print wherein toner mass consumption per pixel is calculated by said toner mass consumption per print divided by number of pixels per print;
- (e) repeat (a) through (d) a predetermined number of times and calculate an average toner mass consumption per pixel;
- (f) calculate a ratio of transition counts / pixel counts; and
- (g) repeat (a) through (f) a predetermined number of times and calculate average ratio of transition counts / pixel counts and assign said toner mass consumption per pixel value to said average ratio of transition counts / pixel counts.

8. The method according to Claim 7, further comprising:  
determining said average ratio of transition counts/pixel counts/pixel counts for pure text, pure halftone and pure solid areas.

9. A method for estimation of toner usage comprising:  
calculating a ratio of transition count/pixel count per page determined from pixel counts and transition counts using a controller in the printer;

obtaining toner mass consumption per page by multiplying pixel counts by a predetermined consumption per pixel value based on said ratio of transition count/pixel count per page; and

subtracting said toner mass consumption value from previous toner mass left in the cartridge to obtaining remaining toner mass and storing in memory; and

calculating and transmitting toner remaining as percentage data to a customer replaceable unit monitor.

10. The method for estimation of toner usage according to Claim 9, further comprising:

calculating said pixel count and said pixel transition count per page using a field programmable gate array.

11. The method for estimation of toner usage according to Claim 10, further comprising:

using a pixel counter register in said field programmable gate array wherein said pixel counter keeps track “ On “ pixel on a page.

12. The method for estimation of toner usage according to Claim 10, further comprising:

using a transition counter register in said field programmable gate array wherein said transition counter register counts only “ 1 to 0 “ or “ 0 to 1 “ transition in horizontal scan direction using video data being sent to a print engine.

13. The method for estimation of toner usage according to Claim 10, further comprising:

determining for different types of images a predetermined consumption per pixel value based on counting pixels and measuring toner usage for each type of image.

14. The method for estimation of toner usage according to Claim 13, further comprising:

storing for each type of image said predetermined consumption per pixel values memory of said controller.

15. The method for estimation of toner usage according to Claim 10, further comprising:

- (a) weighing a cartridge replaceable unit;
- (b) printing a predetermined amount of prints for a given size paper;
- (c) weighing the cartridge replaceable unit after finishing said predetermined amount of prints;
- (d) calculating toner mass consumption for said predetermined amount of prints and toner mass consumption for one print wherein toner mass consumption per pixel is calculated by said toner mass consumption per print divided by number of pixels per print;
- (e) repeat (a) through (d) a predetermined number of times and calculate an average toner mass consumption per pixel;
- (f) calculate a ratio of transition counts / pixel counts; and
- (g) repeat (a) through (f) a predetermined number of times and calculate an average ratio of transition counts / pixel counts and assign said toner mass consumption per pixel value to said average ratio of transition counts / pixel counts.

16. The method for estimation of toner usage according to Claim 15, further comprising:

determining said average ratio of transition counts / pixel counts for pure text, pure halftone and pure solid areas.

17. The method for estimation of toner usage comprising:  
obtaining toner mass consumption per page by multiplying pixel counts by a predetermined consumption per pixel value based on a ratio of transition count/pixel count per page; and

subtracting said toner mass consumption value from previous toner mass left in the cartridge to obtaining remaining toner mass and storing in memory; and

calculating and transmitting toner remaining as percentage data to a customer replaceable unit monitor.

18. The method for estimation of toner usage according to Claim 17, further comprising:

calculating said ratio of transition count/pixel count per page determined by counting pixel counts and transition counts using a controller in the printer.

19. The method for estimation of toner usage according to Claim 18, further comprising:

using a pixel counter register and a transition counter register in a field programmable gate array wherein said pixel counter keeps track “ On “ pixel on a page and said transition counter register counts only “ 1 to 0 “ or “ 0 to 1 “ transition in horizontal scan direction using video data being sent to a print engine.

20. The method for estimation of toner usage according to Claim 17, further comprising:

- (a) weighing a cartridge replaceable unit;
- (b) printing a predetermined amount of prints for a given size paper;
- (c) weighing the cartridge replaceable unit after finishing said predetermined amount of prints;
- (d) calculating toner mass consumption for said predetermined amount of prints and toner mass consumption for one print wherein toner mass consumption per pixel is calculated by said toner mass consumption per print divided by number of pixels per print;
- (e) repeat (a) through (d) a predetermined number of times and calculate an average toner mass consumption per pixel;
- (f) calculate a ratio of transition counts / pixel counts; and
- (g) repeat (a) through (f) a predetermined number of times and calculate an average ratio of transition counts / pixel counts and assign said toner mass consumption per pixel value to said average ratio of transition counts / pixel counts.

21. A printer, comprising:

a logic circuit for calculating a ratio of transition count/pixel count using a pixel transition count and a pixel count for a printed image; and

a controller for estimating toner consumption based on said ratio of transition count/pixel count.

22. The printer according to Claim 21 wherein said logic circuit is a field-programmable gate array.